

Application No. 09/022,336

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**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

Claim 1 (Withdrawn). In a method for charging a valve-regulated, lead-acid (VRLA) cell at a charge voltage which has a value that is slightly in excess of the value of the open-circuit voltage of the cell, said cell including, in spaced relationship, a positive electrode and a negative electrode, and sandwiched therebetween electrolyte-containing separator means in which electrolyte is contained, wherein, during charging of the cell, there is produced at the positive and negative electrodes respectively oxygen gas and hydrogen gas in a predetermined amount, a portion of the oxygen gas tending to migrate through the electrolyte-containing separator means to the negative electrode and cause depolarization thereof, and wherein there is also formed at the positive electrode hydrogen ions which migrate to the negative electrode to form hydrogen gas in an amount less than said predetermined amount, the negative electrode tending to discharge over a prolonged period of time during charging, the improvement comprising inhibiting the tendency of the negative electrode to discharge during charging by controlling the amount of oxygen gas in the cell by catalytically converting a portion of the oxygen gas and a portion of the predetermined amount of hydrogen gas to water.

Claim 2 (Withdrawn). A method according to Claim 1 wherein the charge voltage is no greater than about 0.3 volt in excess of the value of the open-circuit voltage in an application in which there is an intermittent flow of current.

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Claim 3 (Withdrawn). A method according to Claim 1 wherein the charge voltage is no greater than about 0.2 volt in excess of the value of the open-circuit voltage in an application in which the flow of current is uninterrupted.

Claim 4 (Withdrawn). An electric cell comprising:

- (A) a sealed housing;
- (B) a positive electrode positioned in the housing;
- (C) a negative electrode positioned in the housing in spaced relationship from the positive electrode;
- (D) electrolyte-containing separator means positioned between said electrodes and containing electrolyte;
- (E) a gas space within said housing;
- (F) a pressure relief valve which allows gas to escape from the housing and which prevents oxygen gas from outside the housing to contact said negative electrode;
- (G) a catalyst in gas communication with the gas space for converting oxygen gas and hydrogen gas which is generated in said housing to water; and
- (H) means for charging the cell at a charge voltage having a value which is slightly in excess of the value of the open-circuit voltage of the cell.

Claim 5 (Withdrawn). A cell according to Claim 4, wherein the means for charging the cell provides an uninterrupted flow of current.

Claim 6 (Withdrawn). A cell according to Claim 4, wherein the means for charging the battery provides an intermittent flow of current.

Claim 7 (Currently amended). A valve regulated lead acid electric cell comprising:

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a sealed housing;  
a positive electrode positioned in the housing;  
a negative electrode positioned in the housing in spaced relationship from the positive electrode;  
an electrolyte in said housing in contact with said positive and negative electrodes;  
a gas space within said housing;  
a pressure relief valve which allows gas to escape from the housing and which prevents oxygen gas from outside the housing to contact said negative electrode;  
a gas-permeable catalyst container in gas communication with said gas space, said container comprising a flame arresting material having pores of suitable size to permit gas to pass therethrough while being a barrier to a flame, said container being encased in a gas-permeable hydrophobic solid film comprising PTFE; and  
a catalyst arranged in said catalyst container for converting oxygen gas and hydrogen gas ~~which is generated~~ within the housing to water vapor.

Claims 8-11 (Canceled).

Claim 12 (Previously presented). A cell according to Claim 7, wherein said catalyst container is secured to said relief valve to be removable from the housing with said relief valve.

Claim 13 (Canceled).

Claim 14 (Canceled).

Claim 15 (Currently amended). A device for recombining gases in a storage battery; comprising:

a gas-permeable catalyst container, said container comprising a flame arresting

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material having pores of suitable size to permit gas to pass therethrough and which acts as a barrier to a flame;

a catalyst arranged within said container; and

a gas-permeable hydrophobic solid film encasing said container, said hydrophobic film comprising PTFE.

Claim 16 (Canceled).

Claim 17 (Canceled).

Claim 18 (Currently amended). A device in accordance with claim 17 15 wherein said film has a thickness in the range of about .002 inches to .003 inches.

Claim 19 (Currently amended). A device in accordance with claim 17 15 wherein said film has a pore size of about .22 microns.

Claims 20-21 (Canceled).

Claim 22 (Currently amended). A device in accordance with claim 15 wherein said container has an outside diameter of about 6 inches and comprises alumina-porcelain, and said hydrophobic film comprises PTFE.

Claim 23 (Currently amended) A device in accordance with claim 17 15 wherein said container is cylindrical.

Claim 24 (Currently amended). A device in accordance with claim 17 15 wherein said container has an opening at an end of said container through which the catalyst is added, said opening being sealed closed with an epoxy.

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Claim 25 (Currently amended). A device in accordance with claim 47 15 having four layers of said film.

Claim 26 (Canceled).

Claim 27 (Currently amended). A vent assembly for sealing a VRLA battery cell having a sealed housing and a gas space within said housing, said device comprising:

a vent body through which gas from inside the housing can vent to outside the housing;

a pressure relief valve member within said vent body to allow excess gas to escape from the housing and which prevents gas outside the housing from entering the housing;

a gas-permeable catalyst container supported on said body to be in gas communication with said gas space when said vent assembly seals the battery cell, said catalyst container comprising a flame arresting material having pores of suitable size to permit gas to pass therethrough while being a barrier to a flame, said container being encased in a gas-permeable hydrophobic solid film; and

a catalyst arranged in said catalyst container for recombining oxygen gas and hydrogen gas generated in the cell to water vapor; and

a cage secured to said body for supporting said catalyst container, said catalyst container fitting within said cage.

Claim 28 (Canceled).

Claim 29 (Currently amended). An assembly in accordance with claim 28 27 wherein said cage is secured to the underside of said vent body.

Claim 30 (Previously presented). An assembly in accordance with claim 27 wherein said vent body has a recess in which said catalyst container is supported and a

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retainer fixed to said vent body for securing said catalyst container within said recess.

Claims 31 (Withdrawn). A method according to claim 1 wherein the open circuit voltage of the cell is about 2.15 volts and the charge voltage is no greater than about 2.35 volts.

Claim 32 (Canceled).

Claim 33 (Previously presented). An assembly in accordance with claim 29 wherein said cage includes openings, and said vent body includes mating pins extending into said openings.

Claim 34. (Previously presented). An assembly in accordance with claim 33 wherein said mating pins are heat staked to secure said cage to said vent body.

Claim 35 (Canceled).

Claim 36 (Currently amended). A cell according to claim 7 wherein said gas-permeable hydrophobic coating comprises PTFE film is a solid film.

Claim 37 (Canceled).

Claim 38 (Previously presented). An assembly in accordance with claim 27 wherein said gas-permeable hydrophobic film comprises PTFE.

Claim 39 (Canceled).

Claim 40 (Previously Presented). A device for recombining gases in a storage battery; comprising:

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a gas-permeable catalyst container, said container being formed of a flame arresting material having pores of suitable size to permit gas to pass therethrough and which acts as a barrier to a flame;

a catalyst arranged within said container; and

means for making all portions of said container that are gas-permeable impermeable to any liquid water while permitting gas to pass through, said means including PTFE.

Claim 41 (Canceled).

Claim 42. (Previously presented) A catalyst device for recombining gases in a storage battery; comprising:

a gas-permeable catalyst container, said container being formed of a flame arresting material having pores of suitable size to permit gas to pass therethrough and which acts as a barrier to a flame;

a catalyst arranged within said container; and

a PTFE gas-permeable hydrophobic solid material attached externally to and surrounding said container in a manner so as to prevent liquid water from passing through said container when said device is combined with said storage battery.

Claim 43 (Currently amended). A device in accordance with claim 14 7 wherein said film is wrapped around said container.

Claim 44 (Previously presented). A device in accordance with claim 15 wherein said film is wrapped around said container.

Claim 45 (Previously presented). A device in accordance with claim 40 wherein said PTFE comprises a film of PTFE.

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Claim 46 (Previously presented). A device in accordance with claim 45 wherein said film is wrapped around said container.

Claim 47 (Previously presented). A device in accordance with claim 42 wherein said PTFE material is a film wrapped around said container.

Claim 48 (Previously presented). A device for combining gases within a storage battery; comprising:

a catalyst container having an interior, said container comprising a flame arresting material having pores of suitable size to permit gas to pass between said interior and an exterior of said device and which acts as a barrier to a flame;

a catalyst arranged within said interior, said catalyst capable of reacting oxygen gas and hydrogen gas to form water vapor; and

a gas permeable liquid water barrier comprising solid PTFE attached to said container and positioned to prevent liquid water from passing between said interior of said container and said exterior of said device.

Claim 49 (Previously presented). A device in accordance with claim 48 wherein said barrier comprises a film wrapped around said container.

Claim 50 (Currently amended). A device in accordance with claim 47 15 wherein said flame arrestor comprises a ceramic material.

Claim 51 (New). A vent assembly for sealing a VRLA cell having a sealed housing and a gas space within said housing and comprising a catalyst device in accordance with claim 42, said vent assembly further comprising:

a vent body through which gas from inside the housing can vent to outside the housing;

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a pressure relief valve member within said vent body to allow excess gas to escape from the housing and which prevents gas outside the housing from entering the housing; and

said catalyst container being supported on said vent body to be in gas communication with said gas space when said vent assembly seals said cell.

Claim 52 (New). A vent assembly for sealing a VRLA cell having a sealed housing and a gas space within said housing and comprising a catalyst device in accordance with claim 40, said vent assembly further comprising:

a vent body through which gas from inside the housing can vent to outside the housing;

a pressure relief valve member within said vent body to allow excess gas to escape from the housing and which prevents gas outside the housing from entering the housing; and

said catalyst container being supported on said vent body to be in gas communication with said gas space when said vent assembly seals said cell.

Claim 53 (New). A vent assembly for sealing a VRLA cell having a sealed housing and a gas space within said housing and comprising a catalyst device in accordance with claim 48, said vent assembly further comprising:

a vent body through which gas from inside the housing can vent to outside the housing;

a pressure relief valve member within said vent body to allow excess gas to escape from the housing and which prevents gas outside the housing from entering the housing; and

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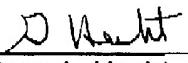
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said catalyst container being supported on said vent body to be in gas communication with said gas space when said vent assembly seals said cell.

Respectfully submitted,

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